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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PS 2734 for a patent by TECHNOLOGICAL RESOURCES PTY LTD as filed on 31 May 2002.

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Eleventh day of June 2003

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Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

TECHNOLOGICAL RESOURCES PTY LTD

A.C.N. 002 183 557

Invention Title:

MICROWAVE TREATMENT OF ORES

The invention is described in the following statement:

MICROWAVE TREATMENT OF ORES

The present invention relates to treating ores with microwave energy to facilitate subsequent processing of the ores.

The present invention relates particularly, although by no means exclusively, to using microwave energy to treat ores to facilitate subsequent processing of the ores to recover valuable metals from the ores.

There have been a number of proposals to use microwave energy in a range of mining applications, such as comminution of ores, and there is on-going research and development work into these mining applications.

An object of the present invention is to provide a microwave energy-based method of treating ores to facilitate subsequent processing of the ores to recover valuable metals from the ores.

According to the present invention there is provided a method of treating ore particles to facilitate subsequent processing of the ore particles, for example to recover a valuable metal from the ore, which method includes exposing the ore particles to microwave energy and structurally altering the ore particles.

Structural alteration of the ore particles is the result of differences in thermal expansion of minerals within ore particles in response to exposure to microwave energy that results in regions of high stress/strain within ore particles which in turn leads to micro-cracking or other physical changes within ore particles.

Structural alteration of the ore particles is best achieved in ores which are heterogeneous in nature

with minerals that are susceptible to microwaves dispersed within a matrix of "inert" minerals. Exposure to high energy microwaves causes rapid localised heating of the susceptible minerals and very rapid stress and crack generation. In extreme cases this can cause the formation of shock waves to generate cracks through the ore which propagate away from the original point source.

The term "microwave energy", is herein understood to mean electromagnetic radiation that has frequencies in the range of 0.3-300 GHz.

The subsequent processing of the ore particles may include heap leaching of the particles.

By way of further example, the subsequent processing of the ore particles may include comminution of the particles to reduce the sizes of the particles.

Preferably the method includes exposing the ore particles to microwave energy and structurally altering the ore particles without significantly altering the mineralogy, ie composition, of the ore. Preferably this is achieved by exposing the particles to very high energy microwaves for short duration to maximise the level of stress generated around the susceptor minerals without causing them to overheat for sufficient time periods to cause significant mineralogical changes.

Preferably the method includes exposing the ore particles to microwave energy and structurally altering the ore particles with minimal change to the sizes of the ore particles.

The method may include screening ore particles prior to exposing the ore particles to microwave energy in order to provide a preferred particle size distribution

for microwave energy treatment.

Preferably the method includes screening ore particles prior to exposing the ore particles to microwave energy in order to remove fines from the ore particles.

Preferably the method includes achieving the short duration exposure by exposing the ore particles to pulsed microwave energy.

The particles may be exposed to one or more pulses of microwaves during a period of time in which the particles are in a microwave cavity or a zone in which the particles are being subjected to the microwave treatment.

The use of pulsed microwave energy minimises the power requirements of the method and maximises thermal cycling of the ore particles. By appropriate selection of operating conditions, pulsed microwave energy minimises heating of ore particles to temperatures at which there are changes to the mineralogy of the particles.

Preferably the pulsed microwave energy includes pulses of short duration and high energy.

The term "short duration" is understood herein to mean that the time period of each pulse is less than 1 second.

Preferably the pulse time period is less than 0.1 second.

More preferably the pulse time period is less than 0.001 second.

In a situation in which the subsequent ore processing is heap leaching the ore, the main objective of

exposing ore particles to microwave energy is to structurally alter the ore particles to improve access of a leach solution to ore particles.

Improved access to the leach solution may be the result of breakdown of ore particles into smaller particles.

However, in this application, preferably improved access to the leach solution is the result of structural weakening of ore particles that improves porosity of the particles without causing substantial particle breakdown.

The improvement in porosity resulting from microwave energy exposure makes it possible to use larger sized particles of a given ore type in heap leaching than would normally be the case with the ore type.

The width of the particle size range presented for microwave energy treatment may influence the extent of particle breakdown. Specifically, there may be a greater likelihood of particle breakdown with a wider particle size distribution than with a narrower particle size distribution.

Preferably the ore particles include microwave susceptor and non-susceptor minerals, whereby improved access to the leach solution is the result of structural changes at the interface of microwave susceptor and non-susceptor minerals of the ore components.

The ores of particular interest to the applicant are ores in which the valuable metals are part of the microwave susceptor minerals of the ores.

Preferably the ores are ores in which the valuable metal is in present as a sulphide.

The applicant is interested particularly in copper-containing ores in which the copper is present as a sulphide, such as chalcopyrite or chalcocite.

The applicant is also interested in nickel-containing ores in which the nickel is present as a sulphide.

Preferably the ore particles have a major dimension of 15 cm or less prior to exposure to microwave energy.

The wavelength of the microwave energy and the exposure time may be selected depending on relevant factors.

Relevant factors may include ore type, particle size, particle size distribution, and requirements for subsequent processing of the ore.

The method includes any suitable steps for exposing the ore to microwave energy.

One suitable option includes allowing the ore to free-fall down a transfer chute past a microwave energy generator.

The free-fall option is a preferred option to a forced feed option in a mining industry environment because of the materials handling issues that are often associated with the mining industry.

Preferably the method includes transporting the ore to an inlet end of the transfer chute on a conveyor and transporting the microwave-treated ore from an outlet end of the transfer chute on a conveyor.

Many modifications may be made to the e present invention described above without departing from the spirit and scope of the present invention.